

STUDY TITLE: Quieting Technologies for Reducing Noise During Seismic Surveying and Pile Driving Workshop Summary Report.

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CONTRACT NUMBER(S): M12PC00008.

SPONSORING OCS REGION: Headquarters.

APPLICABLE PLANNING AREA(S): All.

FISCAL YEAR(S) OF PROJECT FUNDING: 2012.

COMPLETION DATE OF REPORT: February 2014.

COST(S): FY 2012: \$387,800; CUMULATIVE PROJECT COST: \$387,800.

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KEY WORDS: quieting technology; alternative technology; seismic; pile driving; support vessel noise.

BACKGROUND: The Outer Continental Shelf Lands Act (OCSLA), as amended by the Energy Policy Act of 2005, and supporting regulations necessitate studies to assess environmental impacts from activities authorized and permitted by the Bureau of Ocean Energy Management (BOEM). These activities include geological and geophysical exploration and pile driving during construction as well as associated vessel operations.

BOEM organized this Workshop where 140 government, industry, non-governmental organization, and academic experts examined quieting technologies that have the potential to reduce the impacts of noise generated during offshore exploratory seismic surveys and pile driving and from the vessels associated with these activities. Of the 140 attendees, 21 international experts representing eight countries shared the perspective from their country's regulatory standpoints and their efforts to minimize underwater noise through various programs and technologies.

OBJECTIVES: The Workshop examined current and emerging technologies that have the potential to reduce the impacts of noise generated during offshore exploratory seismic surveys and pile driving and from vessels associated with these activities. An Information Synthesis document summarizing available literature regarding the status of existing noise quieting technologies was prepared and made available to the Workshop participants prior to the Workshop. Specifically, the goals of the Workshop were to

1. Review and evaluate recent developments (current, emerging/potential) in quieting technologies for
 - seismic surveying, whether proposed or in development;
 - pile driving during offshore renewable energy activities; and
 - vessel noise associated with Outer Continental Shelf (OCS) energy development activities.

2. Identify the spatial, spectral, and temporal features of the acoustic characteristics of new technologies in varying environments compared to those from existing technologies.
3. Identify the system and site-specific requirements for operation of these new technologies and limitations in their use.
4. Discuss potential impacts, both positive and/or negative, in using these technologies:
 - operational and cost effectiveness; and
 - potential environmental impacts from these technologies.
5. Evaluate data quality and cost effectiveness of these technologies compared to existing marine acoustic technologies.
6. Discuss what the current and emerging/potential technologies can do to reduce sound output.
7. Examine potential changes in environmental impacts from these technologies compared to those from existing technologies.
8. Identify which technologies, if any, provide the most promise for full or partial replacement of conventional technologies and specify the conditions that might warrant their use.
9. Identify next steps, if appropriate, for the further development of these technologies, including potential incentives for field testing.

DESCRIPTION: The Workshop agenda was developed concurrently with the identification of key issues by the Workshop Chair in conjunction with the other Scientific/Technical Review Panel members and BOEM. The key issues became the focal topics for Workshop Breakout Sessions. The Workshop format was developed to maximize direct coordination among each topic's experts in various Breakout Sessions while also allowing for information sharing across each of the source types discussed during the Workshop Plenary Sessions.

The Workshop design allowed for focused discussion among stakeholders to examine quieting technologies and encouraged interactive listening to allow for information sharing across disciplines and areas of expertise. By focusing on quieting technologies themselves rather than on the associated impacts, the Workshop allowed for focused examination and discussion of the methods and equipment design that resulted in lower sound output.

SIGNIFICANT CONCLUSIONS: Priority data gaps identified during the Workshop to facilitate the advancement of noise quieting for the three topic areas were as follows:

- Development and implementation of consistent acoustic terminology and noise measurement methods/standards is needed so that direct, quantitative comparisons can be made. The EU has developed working groups to examine this issue and work towards development of standards; their progress should be monitored and their findings potentially emulated.
- A determination of what property of the "source" needs to be reduced in order to achieve quieting is needed.
- A comparison between the relative environmental impacts of marine vibroseis (MV) and airgun arrays should be a priority, as MV is one of the most promising alternative quieting technologies.
- The Environmental Assessment prepared for MV indicated that MV will augment airguns for specific applications but will not replace them. More research is needed on MV to clearly define its capabilities and how and where it can be utilized.
- A better understanding of the potential environmental impacts of the new technologies is needed, with special attention as to whether the technology is simply trading one set of impacts for another.
- Examination of these issues under the actual variety of spatial, temporal, and spectral scenarios is critical to determining the most effective method of eliciting potential quieting gains in a project application involving any combination of these three "quieting filters."

- Development of standards/goals for reductions in sound levels and establishment of a more streamlined permitting process for those that meet those goals/standards is needed, as well as identification of environmentally sensitive habitat in which activities will be allowed only if those goals/standards are met.
- Examination of cumulative sound studies in the marine environment is needed.
- Development, with industry, of a “best practices” strategy for typical site scenarios is needed; this would provide a risk reduction template for agencies to endorse.
- The next steps to advance pile driving technologies include establishment of standard field test sites around the world that represent comparable and standardized ranges, sediments, depths, etc.
- Establishment of preliminary regulatory criteria and other incentives to stimulate development and implementation. Development of preliminary criteria will result in some noise reduction while verifying and modifying the criteria in order to attain further noise reduction.
- The overall contribution to ambient noise from support vessels needs to be ascertained in order to determine if ship noise is really a significant issue. If it is determined to be a significant issue, then reducing noise from support vessels should be a priority, specifically if the sound radiated from support vessels has the potential to cause significant chronic effects.
- Development of a database of source sound levels for different types of vessels with different propulsion plants using a standard for source level measurements in consistent units is needed.
- Development of an agency-endorsed, biologically relevant noise limit for vessels, which could establish a more effective target for engineers to work towards, is needed.
- There should be a focus on quieting the noisiest vessels.
- The relative noise contributions from the three topic sources in comparison to the relative contributions made by other aspects of the energy industry and other industries should be examined.

STUDY RESULTS: The Information Synthesis and Workshop illustrated that while there are a number of promising new technologies and mitigation measures for quieting noise from airguns, pile driving, and support vessels, much more information is needed to make informed decisions regarding what methods can be used effectively and what benefits will be realized. Much work still needs to be done in order to have a common ground for (1) determining noise levels, (2) what defines noise reductions, (3) the establishment of standards or guidelines to assist the continued development of methodologies, and (4) a better understanding of the noise in the marine environment. One of the principal issues was the need for development and implementation of consistent acoustic terminology and noise measurement methods/standards for all three topic areas so that data comparisons can be made.

Although research is ongoing in all three topic areas to develop new technologies and mitigation measures, many participants felt the government should consider incentives for encouraging the development of these technologies.. A continued dialog between industry and BOEM would be beneficial to help identify appropriate incentives, which could include a more streamlined regulatory process or fewer restrictions on the timing or location of activities. Regulatory agencies, partnering with industry and other stakeholders, are encouraged to lead this process to avoid cost, conflict, and ongoing injury to the environment. Additional research funding is needed to continue the development of technologies, standards, and guidelines and further the understanding of noise in the marine environment.

STUDY PRODUCT(S): CSA Ocean Sciences Inc. 2014. Quieting Technologies for Reducing Noise During Seismic Surveying and Pile Driving Workshop. Summary Report for the US Dept. of the Interior, Bureau of Ocean Energy Management BOEM 2014-061. Contract Number M12PC00008. 70 pp. + apps.